

**United States Department of Agriculture
Agricultural Marketing Service, Science & Technology
Pesticide Data Program**

SOP No.: PDP-LABOP-03		Page 1 of 16
Title: Sample Preparation for Fresh Fruit and Vegetable, Grain, Fish, and Processed Commodities		
Revision: 20	Replaces: 04/01/08	Effective: 07/01/08

1. Purpose:

To provide standard procedures for the preparation of USDA/AMS Pesticide Data Program (PDP) fresh fruit and vegetable, grain, and processed commodities.

2. Scope:

This standard operating procedure (SOP) shall be followed by all laboratories conducting residue studies for PDP, including support laboratories conducting stability or other types of studies that may impact the program.

3. Outline of Procedures:

5.1 Preparation and Homogenization of Fresh Fruit and Vegetable Commodities

- a. Apples
 - b. Asparagus
 - c. Bananas
 - d. Blueberries/Cranberries
 - e. Broccoli
 - f. Cabbage
 - g. Cantaloupes
 - h. Carrots
 - i. Cauliflower
 - j. Celery
 - k. Cherries
 - l. Corn
 - m. Cucumbers
 - n. Eggplant
 - o. Grapes
 - p. Green Beans
 - q. Greens
 - r. Head Lettuce
 - s. Honeydew Melons
 - t. Leaf Lettuce
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- u. Mushrooms
- v. Onions
- w. Oranges/Grapefruit
- x. Peaches/Nectarines
- y. Pears
- z. Peas
- aa. Pineapples
- ab. Plums
- ac. Potatoes
- ad. Spinach
- ae. Strawberries
- af. Summer Squash
- ag. Sweet Peppers
- ah. Sweet Potatoes
- ai. Tomatoes
- aj. Watermelon
- ak. Winter Squash
- 5.2 Preparation and Homogenization of Grains
- 5.3 Preparation and Homogenization of Nuts
- 5.4 Fish
- 5.5 Preparation and Homogenization of Processed Commodities
 - a. Canned Commodities
 - b. Frozen Commodities
 - c. Juices/Concentrates
 - d. Dried Fruits
 - e. Other Processed, Packaged Commodities
- 5.6 Storage of Subsamples
- 5.7 Weighing of Analytical Portion

4. References:

- USDA/AMS Combined Microbiological Data Program/PDP Technical-Quality Assurance Meeting, March 27-31, 2006, Richmond, VA
 - PDP QA/Technical Meeting, May 7-9, 2003
 - USDA/AMS-EPA Planning Meeting, March 14, 2001
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- USDA/AMS PDP Quality Assurance(QA)/Technical Meeting, February 21-22, 2001
- Federal/State Meeting, October 31-November 2, 2000
- FDA Standard Operating Procedure for the Total Diet Study KCX-1, Appendix E, Final Preparation Procedures, January 19, 1993
- FDA Standard Operating Procedure for the Total Diet Study KCX-1, Appendix F, Instructions for the Items Prepared by Contract Kitchen, January 19, 1993

5. Specific Procedures:

This SOP represents minimum PDP requirements and is presented as a general guideline. Each laboratory shall have written procedures that provide specific details concerning how the procedure has been implemented in that laboratory. These instructions shall include specific practices for minimizing cross-contamination during preparation of multiple samples (e.g., cleaning of equipment and utensils between samples). Both the USDA/AMS SOPs and the laboratory's internal SOPs will be used as the measure of compliance in the event of a USDA/AMS laboratory review.

5.1 Preparation and Homogenization of Fresh Fruit and Vegetable Commodities

Refer to SOP PDP-LABOP-01 for sample receipt and acceptability criteria.

For all commodities, the entire sample shall be homogenized. If the entire sample does not fit into the homogenizer/chopper at one time, then the sample may be homogenized in portions. All portions shall be mixed together in a clean container to assure an evenly mixed sample.

If the laboratory receives a sample that weighs significantly more than the targeted weight (e.g., 10 pounds when target weight is 5 pounds), then the laboratory may randomly select the targeted weight of product for homogenization, as long as units or bunches are not broken (e.g., halving melons or splitting grape bunches). Document on the Sample Information Form (SIF) that the sample was unusually large and contact the PDP Sampling Manager.

5.1.a Apples

Wash each apple under cold running tap water for approximately 15-20 seconds to assure that all surfaces of the apple have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Do not peel. Remove the stem, if present. With a commercially available apple corer

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remove core or, using a clean, dry knife, cut each apple in half or quarters and remove the core portion. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.b Asparagus

Remove an inch or two of the woody stem, if inedible. Wash asparagus spears under cold running tap water for approximately 15-20 seconds to assure that the water has rinsed all portions of the sample. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is not required.

5.1.c Bananas

If necessary, banana samples may be stored in a secure location at room temperature for up to 72 hours for ripening purposes. Peel each fruit. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.d Blueberries/Cranberries

Wash blueberries/cranberries by the handful or by using a colander under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is not required.

5.1.e Broccoli

Visually examine and discard any damaged portion or wilted florets. Additionally, it may be necessary to remove an inch or two of the woody stem, if inedible. Wash the sample under cold running tap water for approximately 15-20 seconds to assure that the water has rinsed all portions of the sample. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is not required.

5.1.f Cabbage

Visually examine the head and remove wrapper and damaged or wilted leaves. Rinse the head under cold running tap water for approximately 15-20 seconds. Turn the head top side down. Allow to

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drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.g Cantaloupes

Using a clean, dry knife, cut each cantaloupe in half and remove seeds and rind. Halves may be further divided at this point to facilitate removal of the rind. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.h Carrots

Hold each carrot under cold running tap water and gently scrub the entire surface with a clean vegetable brush to remove any loose soil and grit. Rinse each scrubbed carrot under cold running tap water for approximately 15-20 seconds to assure that all surfaces of the carrot have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. With a clean, dry knife, remove stem cap portion from each carrot. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.i Cauliflower

Visually examine the head and remove wrapper leaves and any damaged portions. Rinse the head under cold running tap water for approximately 15-20 seconds. Turn the head top side up. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogenous mixture is attained. Unit counting is required.

5.1.j Celery

Using a clean, dry knife, remove the inedible portion of the stalk (i.e., the woody part at the base of the stalk) to allow the stems to separate. Do not remove the leaves unless discolored or damaged. Wash the stems under cold running water for approximately 15-20 seconds to assure that all surfaces have been rinsed and that all extraneous matter (e.g., soil) is removed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is not required.

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5.1.k Cherries

Remove the stem from each cherry. Wash cherries under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Remove the pit, being careful to remove as little of the meat as possible. A commercial cherry pitter is recommended. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is not required.

5.1.l Corn

Remove husk and silk from each ear. Wash each ear under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Using a clean dry knife or other appropriate utensil, remove the kernels from cob. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.m Cucumbers

Wash each cucumber under cold running tap water for approximately 15-20 seconds to assure that all surfaces of the cucumber are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Cucumbers may be halved or quartered at this point to facilitate homogenization. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.n Eggplant

Wash each eggplant under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Using a clean, dry knife, remove the end pieces. Mechanically chop just until a visually homogenous mixture is attained. Unit counting is required.

5.1.o Grapes

Wash each sample under cold running tap water for approximately 15-20 seconds to assure that all surfaces have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Remove all stems and extraneous matter. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is not required.

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5.1.p Green Beans

Wash fresh beans under cold running tap water for approximately 15-20 seconds to assure that all surfaces have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Do not peel. Using a clean, dry knife, remove any stems that are present. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is not required.

5.1.q Greens

Visually examine the sample and remove only the damaged or wilted leaves and any woody stems. Wash remaining sample under cold running tap water for approximately 15-20 seconds to assure that all surfaces have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is not required.

5.1.r Head Lettuce

Visually examine the head and remove wrapper and damaged or wilted leaves. Rinse the head under cold running tap water for approximately 15-20 seconds. Turn the head top side down. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.s Honeydew Melons

Using a clean, dry knife, cut each melon in half and remove seeds and rind. Halves may be further divided at this point to facilitate removal of the rind. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.t Leaf Lettuce

Visually examine the sample and remove only the damaged or wilted leaves and any woody stems. Wash remaining sample under cold running tap water for approximately 15-20 seconds to assure that all surfaces have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required if discrete bunches are received. Unit counting is not required if loose leaves are received.

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5.1.u Mushrooms

Wash mushrooms under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Using a clean, dry knife, slightly trim end pieces to remove any inedible/woody portions. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is not required.

5.1.v Onions

Using a clean knife, remove onion top, outer layer, first white layer and membrane, and any other inedible portions. Remove root portion last to minimize fumes. Preparation procedures may be performed with onions immersed in cold tap water, with total immersion time for each unit not to exceed 10 minutes. Allow onions to drain at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.w Oranges and Grapefruit

Peel each fruit and remove any excess white membrane. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.x Peaches/Nectarines

Wash each peach under cold running tap water for approximately 15-20 seconds to assure that all surfaces of the peach are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Do not peel. Remove stem and leaves if present. Using a clean, dry knife, cut the peach around the pit (i.e., without cutting through the pit). Remove the pit, being careful to remove as little of the meat as possible. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.y Pears

Wash each pear under cold running tap water for approximately 15-20 seconds to assure that all surfaces of the pear have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Do not peel. Remove stem, if present. Using a clean, dry knife, cut each pear in half or quarters and remove the core portion. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

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5.1.z Peas

For each sample, shell enough peas to comprise at least one cup. Discard pods. Rinse peas under cold running tap water for approximately 15-20 seconds to assure that all surfaces have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is not required.

5.1.aa Pineapples

Wash each pineapple under cold running tap water for approximately 15-20 seconds to assure that all surfaces of the fruit have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Remove the top of each pineapple. Using a clean, dry knife, cut in half and remove core and shell. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.ab Plums

Wash each plum under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Do not peel. Remove stem and leaves if present. Using a clean, dry knife, cut the plum around the pit (i.e., without cutting through the pit). Remove the pit, being careful to remove as little of the meat as possible. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.ac Potatoes

Hold each potato under cold running tap water and gently scrub the entire surface with a clean vegetable brush to remove any loose soil and grit. Rinse each scrubbed potato under cold running tap for approximately 15-20 seconds to assure that all surfaces of the potato have been rinsed and allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.ad Spinach

Visually examine the sample and remove only the damaged or wilted leaves and any woody stems. Wash remaining sample under cold running tap water for approximately 15-20 seconds to assure that

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all surfaces have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface.

Note: Bagged pre-washed spinach does not require washing by the laboratory. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is not required.

5.1.ae Strawberries

Wash strawberries by the handful or by using a colander under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Remove stems and leaves if present. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is not required.

5.1.af Summer Squash

Wash each squash under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Using a clean, dry knife, remove end pieces. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.ag Sweet Peppers

Wash each pepper under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Using a clean, dry knife, remove stem, core, and seeds. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.ah Sweet Potatoes

Hold each sweet potato under cold running tap water and gently scrub the entire surface with a clean vegetable brush to remove any loose soil and grit (remove any woody stems if present). Rinse each scrubbed sweet potato under cold running tap for approximately 15-20 seconds to assure that all surfaces have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

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5.1.ai Tomatoes

Wash each tomato under cold running tap water for approximately 15-20 seconds to assure that all surfaces of the tomato are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Do not peel. Using a clean, dry knife, cut the tomato around the stem area. Remove any stem, being careful to remove as little of the meat as possible. The tomatoes may be quartered prior to homogenization. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.aj Watermelon

Wash each melon under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Using a clean, dry knife, cut each watermelon into quarters, and remove the rind. For large watermelons take alternate quarters of each fruit and mechanically chop just until a visually homogeneous mixture is attained. For small watermelons, take the entire sample and mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.1.ak Winter Squash

Wash each squash under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. When possible, using a clean, dry knife, remove stem and/or end pieces. Mechanically chop just until a visually homogeneous mixture is attained. Unit counting is required.

5.2 Preparation and Homogenization of Grains

The sample is defined as the portion that the collector sends to the laboratory, usually 1 kilogram. Pour entire grain sample into a Boerner Divider and use one of the two resulting 500 gram sub-samples for homogenization (the remaining 500 gram sub-sample can be stored). Grind the 500 gram subsample using an appropriate device (e.g., Falling 3300 laboratory mill, Jacobsen grinder, UDY). Tumble the resulting powder homogenate to obtain a homogeneous mixture. Unit counting is not required.

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5.3 Preparation and Homogenization of Nuts

The sample is defined as the portion that the collector sends to the laboratory, usually one pound. The entire sample shall be homogenized

5.3.a Almonds

Grind the entire sample using an appropriate device (e.g., centrifugal mill, Wiley mill, etc.) just until a visually homogeneous mixture is attained. Unit counting is not required.

5.4 Preparation and Homogenization of Fish

Mechanically homogenize the sample until a visually homogeneous mixture is attained. The laboratory shall use its discretion in the utilization of dry ice during the homogenization procedure.

5.5 Preparation and Homogenization of Processed Commodities

The sample is defined as the portion that the collector sends to the laboratory, usually between one and seven pounds. For all commodities except dried fruits, the entire sample shall be homogenized. For dried fruits, the entire sample is mixed to obtain a representative analytical portion prior to hydration and analysis. If the entire sample does not fit into the homogenizer/chopper at one time, then the sample may be homogenized in portions. All portions shall be mixed together in a clean container to assure an evenly mixed sample.

5.5.a Canned Commodities

If the lid of the can has visible dirt or dust, rinse the lid under cold running tap water for 5 to 10 seconds. Dry the lid with a paper towel. Open each can and pour the entire contents of each can including the liquid into a blender/homogenizer. Blend just until a visually homogeneous mixture is attained.

5.5.b Frozen Commodities

The samples may be chopped while frozen, or to prevent damage to the chopper/homogenizer blades, the sample may be thawed in a refrigerator or in a room temperature water bath. Open the

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containers and pour the entire contents into the chopper/homogenizer. Mechanically chop just until a visually homogeneous mixture is attained.

5.5.c Juices/Concentrates

For fresh and reconstituted juices, assure that sample is evenly mixed in order to obtain a homogeneous mixture. For concentrates, dilute juice in a dry, clean container with cold running tap water, according to label directions. Mix well to ensure a homogeneous mixture. .

Canned product concentrates (e.g., tomato paste) may be considered homogeneous and do not need to be mixed prior to weighing of analytical portion. Dilute appropriate analytical portion with sufficient water to facilitate sample extraction. Report results based on undiluted concentrated product.

5.5.d Dried Fruits

5.5.d.1 Raisins

Open all of the raisin package(s) into a container and mix or shake to obtain a representative analytical portion. Add enough water to cover the analytical portion and soak with water until re-hydrated. Prepare the analytical portion for extraction and analysis. Unit counting is not required

5.5.e Other Processed, Semi-Processed, Packaged Commodities

5.5.e.1 For other processed, packaged products (e.g., corn syrup and peanut butter) that may be considered homogeneous, simply weigh appropriate analytical portion.

5.5.e.2 If a processed, packaged product appears non-homogeneous (e.g., separation of oil from peanut butter), assure that the sample is evenly mixed prior to weighing of analytical portion.

5.5.e.3 For semi-processed raw commodities (e.g., pre-washed, bagged spinach; peeled, cut carrots; etc.) refer to instructions in Section 5.1. Washing is not required.

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5.6 Storage of Subsamples

One or more adequate portions of homogenized sample shall be held in reserve if reanalysis and/or confirmation is needed. For fruit and vegetable samples, this portion shall be distributed among several small containers (polypropylene or styrofoam recommended) rather than one large container. For grain samples (e.g., wheat, soybeans, rice, etc.) one large container is acceptable. For raisins, one container of the dried, mixed sample at room temperature is acceptable. The laboratory internal SOP shall define "adequate portion" and the distribution.

5.7 Weighing of Analytical Portion

An appropriate amount of homogenized sample shall be weighed for analysis. The laboratory internal SOP shall define the sample weight and the necessary precision. The precision shall be defined as:

Actual weight = target analytical weight \pm 0.5%.

For example, the necessary precision for a 50 gram (g) sample is 50 g \pm 0.25 g.

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Revision 20 May 2008 Monitoring Programs Office

- Removed requirement to record the weight/volume of canned commodities, frozen commodities, and juices/concentrates from Sections 5.5.a, 5.5.b, and 5.5.c

Revision 19

- Added Fish to SOP title
- Specified that bagged pre-washed spinach does not require laboratory washing in Section 5.1
- Added preparation and homogenization of fish as Section 5.4 and renumbered remaining sections
- Added semi-processed raw commodity information to Section 5.5.e

Revision 18

- Renamed “sweet cherries” preparation and homogenization subsection to “cherries,” moved to appropriate alphabetical subsection location, and renumbered remaining subsections
- Added preparation and homogenization of nuts procedures as Section 5.3 and renumbered remaining sections

Revision 17

- Added blueberries/cranberries sample preparation procedures to subsection 5.1.d and renumbered remaining 5.1 subsections

Revision 16

- Added greens sample preparation procedures to subsection 5.1.o

Revision 15

- Added reference to 2006 Combined MDP/PDP Technical-Quality Assurance Meeting to subsection 4
- Added dried fruit sample preparation procedures to subsection 5.3 and 5.3.d and renumbered remaining 5.3 subsections
- Added raisin sample preparation procedures to subsection 5.3.d.1
- Added storage requirements for raisins to subsection 5.4
- Specified unit counting requirements for commodities

Revision 14

- Added watermelon preparation and homogenization procedures
-